EPSON

Intelligent IEEE-488 Interface

#8165

✓ PDF

Epson 8165 Intelligent IEEE-488 Interface

Y49299186000

FCC COMPLIANCE STATEMENT FOR AMERICAN USERS

This equipment generates and uses radio frequency energy and if not installed and used properly, that is, in strict accordance with the manufacturer's instructions, may cause interference to radio and television reception. It has been type tested and found to comply with the limits for a Class B computing device in accordance with the specifications in Subpart J of part 15 of FCC Rules, which are designed to provide reasonable protection against such interference in a residential installation. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- — Reorient the receiving antenna
- — Relocate the printer with respect to the receiver
- — Plug the printer into a different outlet so that the printer and receiver are on different branch circuits.

If necessary, the user should consult the dealer or an experienced radio/television technician for additional suggestions. The user may find the following booklet prepared by the Federal Communications Commission helpful:

"Television Interference Handbook."

This booklet is available from the U.S. Government Printing Office, Washington, DC20402. Stock No. 004-000-00450-7.

WARNING

The connection of a non-shielded printer interface cable to this printer will invalidate the FCC Certification of this device and may cause interference levels which exceed the limits established by the FCC for this equipment. If this equipment has more than one interface connector, do not leave cables connected to unused interfaces.

NOTICE

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INTRODUCTION

The Intelligent IEEE-488 Interface #8165 is a versatile and trouble free interface board suitable for data communications between IEEE-488 computers or instruments and Epson printers.

The #8165 interface has a number of impressive features including:

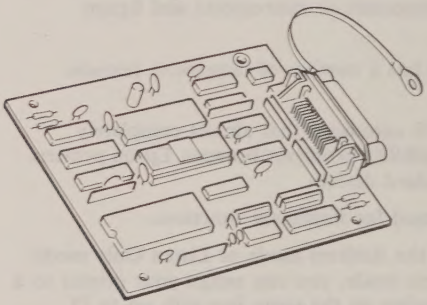
- a standardized IEEE connector that almost completely eliminates incompatibility problems between Epson printers and IEEE-488 standard devices.
- a microprocessor (bus) for intelligent functions.
- operation in either the Address mode or Listen Only mode. When in the Address mode, you can assign your printer to a specific address number on the same line with up to 15 other IEEE standard devices.
- an 8K byte buffer that can store data from a host computer. This allows the printer to continue printing from the buffer and, at the same time, frees up the computer to perform other tasks.

The #8165 optional interface is intended for use with the following Epson printers:

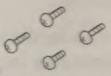
FX, FX+, JX, RX, RX+, HI-80, LX, IX-800, LQ-800/1000, EX-800/1000, LQ-2500, and SQ-2500.

Note
The #8165 cannot be used with the MX series printer.

The following items are included in the #8165 optional interface package:



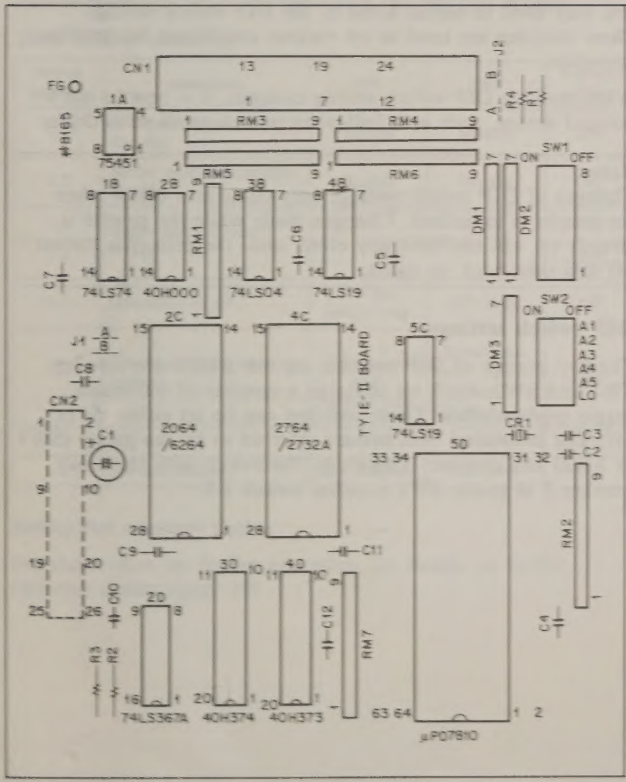
#8165 interface board(1)



Retaining screws (4)

Board layout

Figure 1. Board layout



SETTING THE CONDITIONS

There are two sets of DIP (Dual In-line Package) switches on the interface board. Before you install the #8165 interface, you may need to adjust some of the DIP switch settings. These switches are used to set various conditions for interface operation.

When making DIP switch setting changes, it is best to use a pointed device, such as a ball-point pen or small screwdriver.

Note
Changes of DIP switch settings only come into effect when the printer is initialized. Changes made while the printer is already on will not have any effect until the printer is turned off and then back on again.

DIP switch settings

The two groups of DIP switches on the #8165 are labelled SW1 and SW2. Each set contains a number of individual toggle type switches. These switches can be set either on or off. The individual switches are referred to by the group (SW1 or SW2) and number. Therefore, the switch with the small number 3 in group SW1 is called switch 1-3.

DIP switch 1 (Interface operations)

The table below contains information on switch functions, and the factory setting of each switch. These switches allow you to change interface functions and select the self test modes.

Table 1. DIP switch 1

Switch number	Function	ON	OFF	Factory setting
1-1	Interface board enable/ disable	Enable	Disable	ON
1-2	Buffer operation enable/ disable	Enable	Disable	ON
1-3	Buffer-full recovery timing	See Table 2		OFF
1-4				OFF
1-5	Operation to IFC	IFC and device clear	IFC only	OFF
1-6	Handshaking termination method	Terminates with NRFD = Low	Terminates with NRFD and NDAC = High	OFF
1-7	Self-test	Enable	Disable	OFF
1-8	Self-test modes	Bus monitor	Self print	OFF

Buffer full recovery timing

See the section on Buffer operation for details on buffer recovery timing (page 10).

Table 2. Buffer full recovery timing

Recovery timing in bytes	DIP switch number	
	1-3	1-4
392 bytes	OFF	OFF
528 bytes	OFF	ON
800 bytes	ON	OFF
1,936 bytes	ON	ON

DIP switch 2 (Address assignment)

This DIP switch consists of six switches and is used to select either the Listen Only mode or the Address mode. When in the Address mode, you can assign your printer (device) to a specific address number on the IEEE data bus line. This device number is valid only while the interface is set to the Address mode (DIP switch 2-1 is set to OFF).

Up to 31 address numbers, from 0 to 30, can be selected using a combination of DIP switches. A bit of mathematics is required to calculate the DIP switch settings needed to select a particular address. The formula for determining the device address is shown below.

Address calculation formula:

$$\text{Address} = (2^4 \times A_5) + (2^3 \times A_4) + (2^2 \times A_3) + (2^1 \times A_2) + A_1$$

For each of the DIP switches 2-2 through 2-6:
ON = "1" (binary) and OFF = "0" (binary).

Replace the variable A(n) with either a "1" (ON) or "0" (OFF) to determine the printer (device) address.

Table 3. DIP switch 2

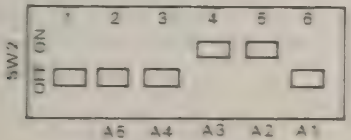
Switch number	Function	ON	OFF	Factory setting
2-1	Address mode. Listen Only mode selection	Listen Only mode	Address mode	OFF
2-2	A5	1	0	OFF
2-3	A4	1	0	OFF
2-4	A3	1	0	OFF
2-5	A2	1	0	OFF
2-6	A1	1	0	OFF

"1" = ON position "0" = OFF position

The example below shows the DIP switch settings for address number "6".

$$6 = \underset{\text{OFF}}{(2^{A5} \times 0)} + \underset{\text{OFF}}{(2^{A4} \times 0)} + \underset{\text{ON}}{(2^{A3} \times 1)} + \underset{\text{ON}}{(2^{A2} \times 1)} + \underset{\text{OFF}}{0}$$

Figure 2. Sample switch settings for address number "6".



Data entry

Data entry is possible in either the Address mode or the Listen Only mode. Use DIP switch 2-1 to select the data entry mode.

Address mode (DIP switch 2-1 set to OFF)

In this mode, the address number specified by DIP switch 2 settings is sent from the controller with the ATN signal low, enabling data entry. (Printer must be designated as a listener.) Data entry is disabled under the following conditions when:

- the listener only designation is cancelled by signals UNL or IFC. However, data remaining in the print buffer will be printed.
- handshaking is stopped by the NRFD signal (Low) during buffer disabled operation.
- the print buffer fills up. (Refer to Buffer Operation.)
- the printer is off-line or a paper-out condition is detected.

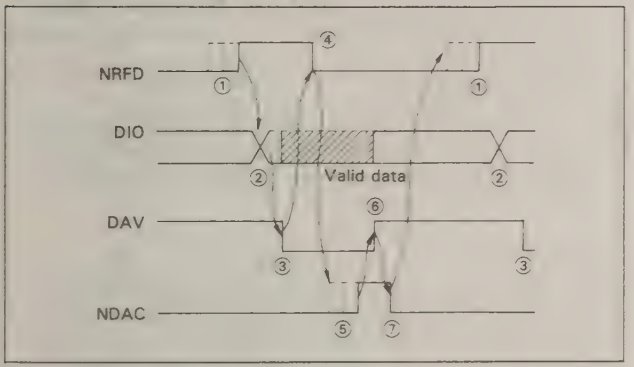
Listen only mode (DIP switch 2-1 set ON)

In this mode, the printer receives data even if the controller device has not designated it as a listener. Data entry is disabled under the conditions described above.

Handshaking protocol

Below is a diagram of data handshaking during IEEE-488 interface operation.

Figure 3. Handshaking timing



Explanation of the handshaking procedure:

① Listener (device) is waiting for data.

② Talker (host computer) outputs data to the data lines (DIO).

③ Talker checks the NRFD (Not Ready For Data) signal level. When the Talker detects a High Signal level, it drops the DAV (Data Valid) signal level to low and data is transmitted.

④ While the DAV is set to low, the Listener reads the data. When the DAV signal goes Low, the Listener drops the NRFD signal to low, indicating that it can no longer receive data.

⑤ At the same time, the NDAC (Not Data Accept) signal level goes high, indicating that the data has been received.

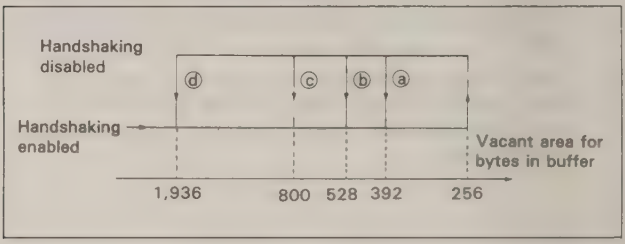
⑥ Talker changes the DAV signal to high, and the data bus becomes invalid.

⑦ When the DAV signal goes high, the Listener drops the NDAC signal to low. The NRFD signal is set High when the Listener is again ready to receive data, beginning the cycle again at ①.

Buffer operation

When the available space for bytes in the print buffer drops to 80 bytes, handshaking is stopped and data entry is disabled. As the printer prints the data in the buffer, the vacant area for bytes increases. When this vacant area reaches one of the four values listed in the table below, data communication is resumed. These settings are operator selectable.

Figure 4. Buffer recovery timing



HARDWARE DESCRIPTION

This section shows the connector pin configuration for the IEEE-488 and gives a brief description of the various bus signals.

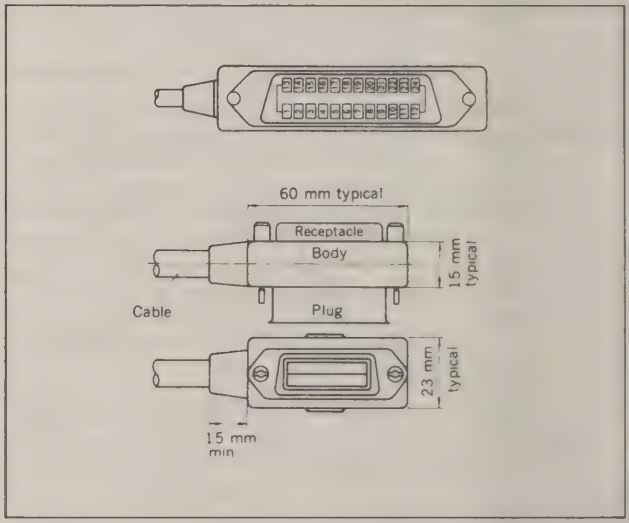
Connectors

Table 4. Pin configuration

Pin No.	Signal name	Description
1	DIO1	Data bit 1 of 8-bit parallel data bus
2	DIO2	Data bit 2 of 8-bit parallel data bus
3	DIO3	Data bit 3 of 8-bit parallel data bus
4	DIO4	Data bit 4 of 8-bit parallel data bus
5	EOI	End of Identity (Not used)
6	DAV	Data Valid (Signal from Talker or Controller)
7	NRFD	Not Ready for Data (High level of this signal indicates that the interface is in the wait state for data input
8	NDAC	Not Data Accept (High level of this signal indicates completion of data acceptance.)
9	IFC	Interface Clear
10	SRQ	Service Request (Not used)
11	ATN	Attention (Data/Command mode selection) (Low level of this signal indicates Command mode).
12	SHIELD	Shield of interface cable
13	DIO5	Data bit 5 of 8-bit parallel data bus
14	DIO6	Data bit 6 of 8-bit parallel data bus
15	DIO7	Data bit 7 of 8-bit parallel data bus
16	DIO8	Data bit 8 of 8-bit parallel data bus
17	REN	Remote Enable

Pin No.	Signal name	Description
18	GND6	Ground
19	GND7	Ground
20	GND8	Ground
21	GND9	Ground
22	GND10	Ground
23	GND11	Ground
24	LOGIC GND	Ground for logic

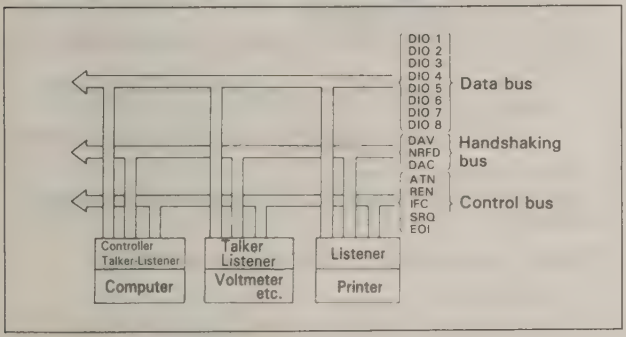
Figure 5. IEEE-488 standard connector



Bus signals

The IEEE-488 has 24 (bus) lines which include: eight lines for data, three lines for handshaking, five lines for control (addresses), and eight ground lines.

Figure 6. Example of system using IEEE-488



IEEE-488 bus signals

- Data signals (DIO1 to DIO8) These eight lines are used for input and output of data and command (address) information. The voltage level of the control bus signal ATN determines whether the signals are data or commands.
  When ATN is low the signals are commands.
  When ATN is high the signals are data.

- Handshaking signals (DAV, NRFD, NDAC) These three lines are used to ensure proper data transmission between the connected devices.

  DAV (Data Valid)
  Indicates that data on the DIO lines are valid.

  NRFD (Not Ready For Data)
  Indicates whether or not the Listener is ready to recieve data on the DIO lines.

  When the signal is low, the Listener is not ready to receive data.

  When the signal is high, the Listener is ready for data.

  NDAC (Not Data Accept)
  Indicates that the Listener has already received data (signal is High).

- Control bus signals (ATN, REN, IFC, SRQ, EOI)

  ATN (Attention)
  Indicates whether the signals on the DIO lines are data or commands (addresses). (See Data Signals)

  REN (Remote Enable)
  This signal selects between the remote and local operations of the connected devices. (This signal is not used by this interface.) Effectively, this interface board operates in the local mode only.

IFC (Interface Clear)
This signal is output by the controller.
DIP switch 1-5 is set ON: Both the interface board and printer are cleared when the IFC signal is applied.

DIP switch 1-5 is set OFF: Only the interface board is cleared when the IFC signal is applied.

SRQ (Service Request)
Used for sending signals from the devices to the controller. (Signal not used by this interface.)

EOI (End of Identity)
This signal indicates the end of data transmission as soon as the last byte is sent. (Signal not used by this interface.)

SELF TEST

This interface has two self test modes that can be selected by DIP switch settings.

To enter a self test mode, first turn off the power, adjust the switches, and then turn the power on again to initialize the new settings. To exit from the self test, turn off the power and reset the DIP switches.

Table 5. Self test modes

DIP switch number		Function
1-7	1-8	
ON	OFF	Self print
ON	ON	Bus monitor

Self print

Data from <20>H through <7E>H are transferred to the printer and the characters are printed.

Bus monitor

In this test, data on the DIO lines are transferred to the printer as 8-bit data and printed in hexadecimal codes.

If the signals on the DIO lines are commands (ATN signal is low), the data is printed in emphasized underlined printing. If the signals are data (ATN signal is high), the data printout is normal.

Example:

3F 55 2A 41 42 0D 0A
command data

SPECIFICATIONS

The #8165 IEEE-488 interface board conforms to the IEEE standard, and is specifically designed for use with Epson printers.

Data transmission:	8-bit parallel
Handshaking:	3-wire handshaking
Total Cable length:	20 meters maximum
Cable length between devices:	5 meters maximum
Number of Devices connectable:	15 uints maximum
Logic convention of signals:	Negative logic True: Low level less than 0.8V False: High level over 2.0V
Buffer (print buffer):	8K bytes

INSTALLATION

The #8165 interface board is designed to be installed inside the printer. Installation or removal of the interface board is easy, and requires only a cross-head type screwdriver.

The following section gives you detailed information on how to install your interface board in a variety of Epson printers. Installation procedures vary slightly depending upon the model of printer that you have.

Caution
Avoid touching the printer's circuit board contacts, as many of these components are sensitive to static electric charges that may build up on your body.

FX series, FX + series, and JX-80 printers

Caution
Turn off the power to the printer and the computer before installing the serial interface. Make sure that all power and interface cables are removed.

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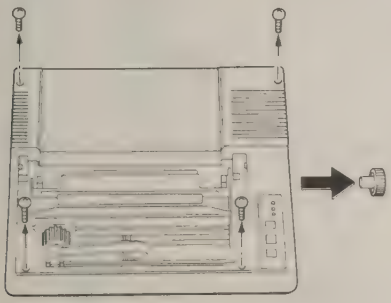
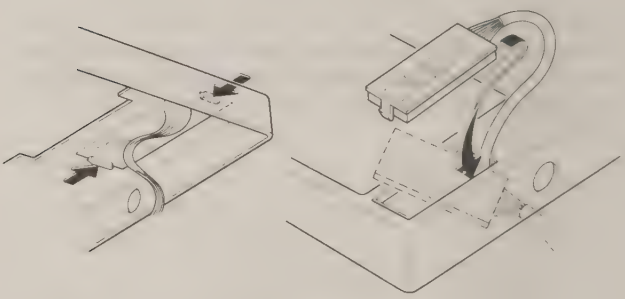
1. Remove any options, such as a tractor unit or cut-sheet feeder.

2. Take off the paper feed knob.
3. Remove the upper case retaining screws using a cross-head screwdriver. (Four screws on the 80-column models and six on the 136-column models.)

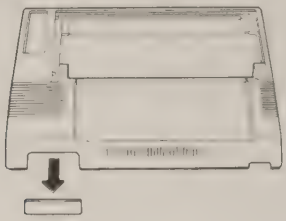
Note
The FX-800/1000 (FX-86e/286e) models have only one screw and two retaining clips on the 80-column models. (There are four clips on the 136-column models.)



4. Partially raise the upper case. Reach under and detach the control panel by squeezing the two retaining clips together. Next, slip the panel back through the upper case.

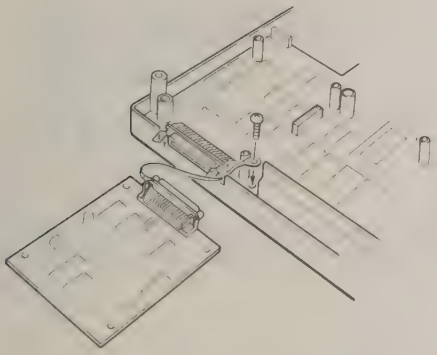


5. Remove the upper case and detach the shield plate.

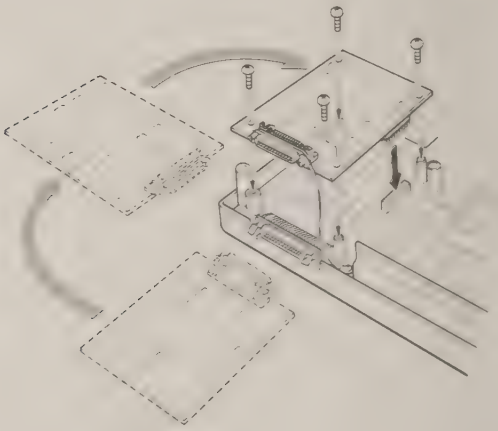


Note
If your printer has an extra board (called a SUMI board) piggy-backed on to the controller board, skip to the next section.

6. Remove the screw and washer from the pole to the left of the parallel connector. (They will not be needed again.)
7. Remove the FG (Frame Ground) screw.
8. Carefully place the interface board next to the printer as shown below. Connect the round end of the FG wire to the main board using the FG screw.



9. Holding the interface board level, rotate it clockwise into position and then carefully insert the connector pins into the mating connector on the main board.
10. Secure the board with the retaining screws provided.



11. Reassemble the printer.

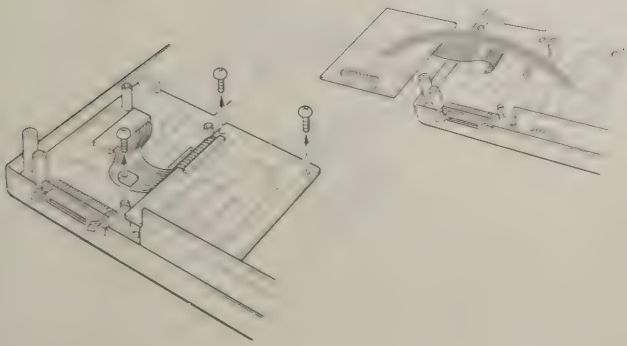
FX printer with SUMI board

If your printer is equipped with a SUMI board piggy-backed on to the main board, then follow the procedures listed below when installing the optional interface. There is no difference in printer operation between printers with or without a SUMI board.

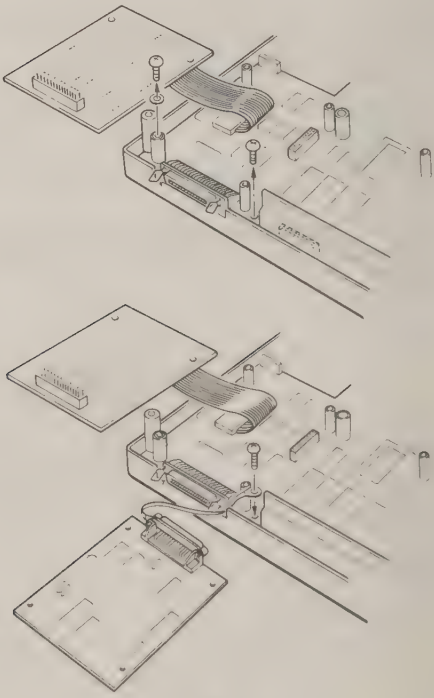
Caution
Turn off the power to the printer and the computer before installing the serial interface. Make sure that all power and interface cables are removed.

---

1. Complete steps 1 through 6 of the previous section to remove the upper case.
2. Remove the screws and the clamp securing the SUMI board.
3. Unplug the SUMI board from the connector on the main board and place it next to the printer with the cable still connected.

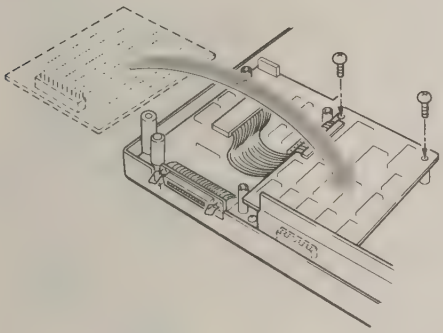


4. Remove the screw and washer from the pole to the left of the parallel connector.
5. Remove the FG screw.
6. Carefully place the interface board next to the printer as shown below. Connect the round end of the FG wire to the main board using the FG screw.



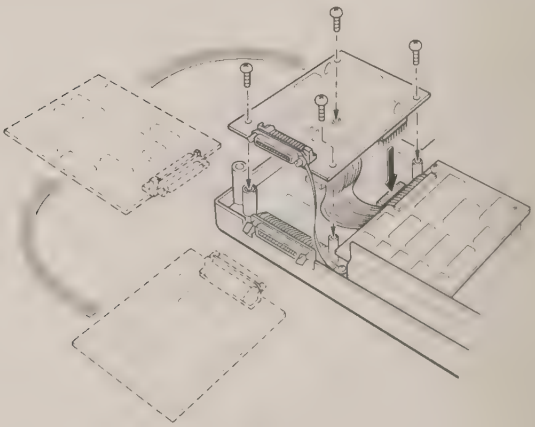
7. Reattach the SUMI board.

Note
Be sure to reinstall the SUMI board before continuing with the interface board installation.



8. Holding the interface board level, rotate it clockwise into position and attach it to the main board. Make sure that the connector pins are properly inserted into the mating connector.

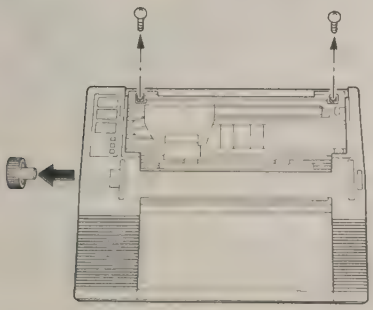
9. Secure the board with the retaining screws provided.



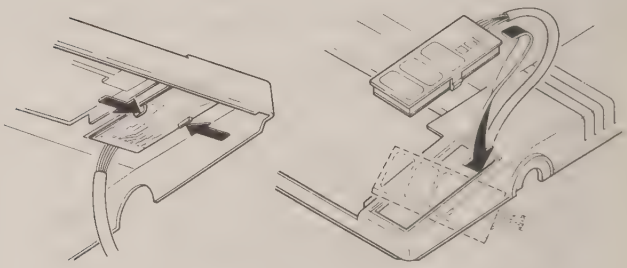
10. Reassemble the printer.

Caution
Turn off the power to the printer and the computer before installing the interface. Make sure that all power and interface cables are removed.

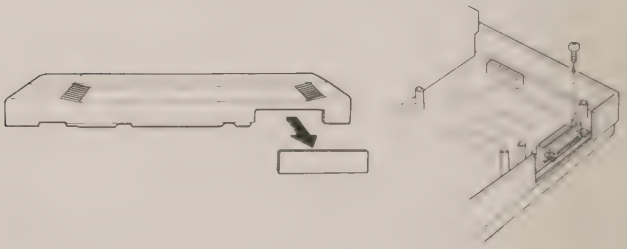
1. Remove the two upper case retaining screws located at the front of the printer.
2. Remove the paper feed knob.



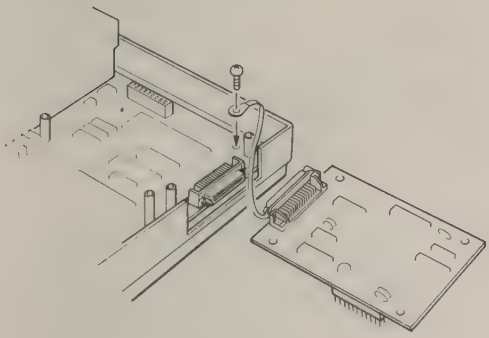
3. Partially raise the upper case of the printer. Reach under the case and detach the control panel by squeezing the retaining clips together.
4. Slip the control panel back through the upper case.



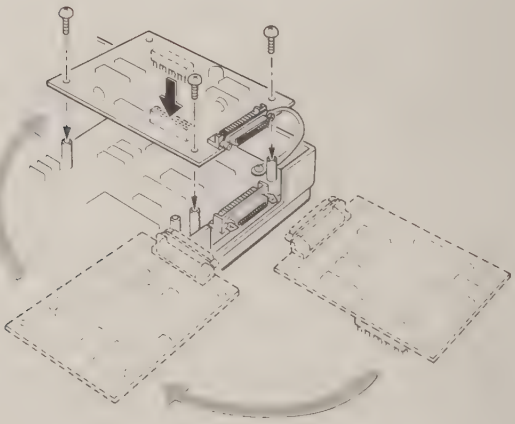
5. Remove the cover and detach the shield plate from the rear of the upper case.
6. Remove the FG (Frame Ground) screw from the main board. This is located on the main board near the back of the printer.



7. Carefully place the interface board next to the printer as shown below. Connect the round end of the FG wire to the main board using the FG screw.



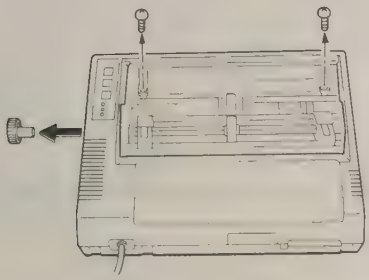
8. Holding the interface board level, rotate it clockwise into position and then carefully insert the connector pins into the mating connector on the main board.
9. Secure the board with the retaining screws provided.



10. Reassemble the printer.

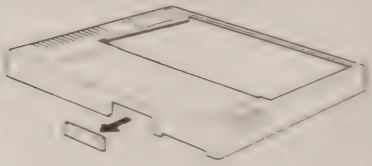
Caution
Turn off the power to the printer and the computer before installing the serial interface. Make sure that all power and interface cables are removed.

1. Remove the paper feed knob and the ribbon cartridge.
2. Remove the upper case retaining screws using a cross-head type screwdriver. (There are two screws on the 80-column and five screws on the 136-column model.)



3. Unplug the control panel cable from the control panel.

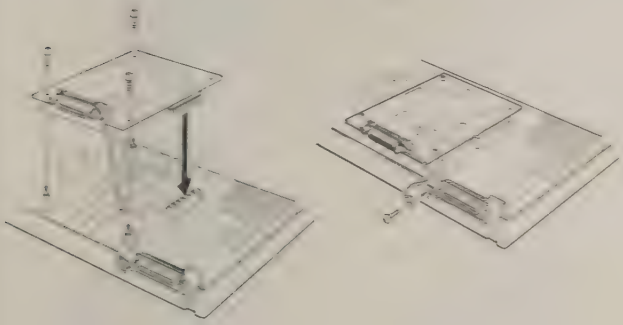
4. Lift off the upper case and detach the shield plate.



5. Attach the interface board, making sure that the connector pins are properly inserted and that the free end of the FG wire is outside the of printer case.

6. Secure the board to the mounting poles with the screws provided.

7. Remove the ground screw located at the back of the printer. Using this screw, connect the round end of the FG wire to the printer frame.



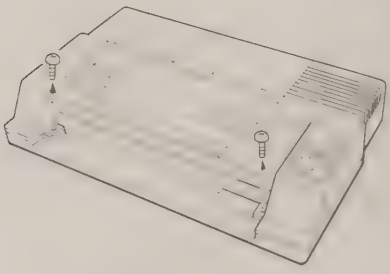
8. Replace the upper case.

Note

When replacing the upper case, take care not to pinch the FG wire between the upper and lower sections of the case.

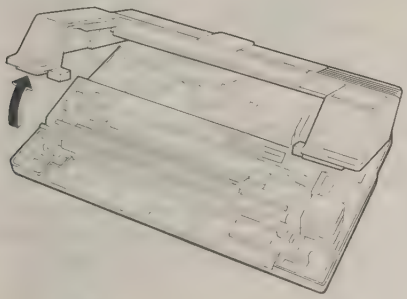
Caution
Make sure that power to the plotter and the computer is turned off. Then disconnect both the AC power and interface cables from the plotter.

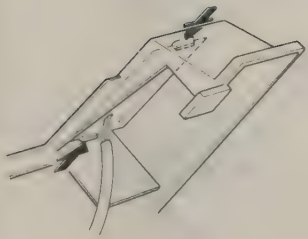
1. Remove the paper feed knob.
2. Remove the plastic cover to expose the two retaining screws located at the front of the plotter. Remove these screws with a cross-head screwdriver.

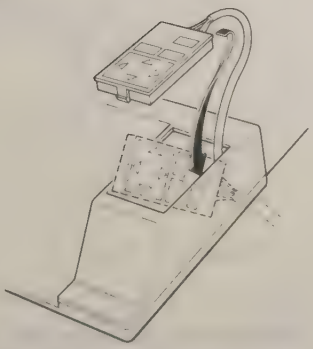


3. Partially raise the front of the upper case. Reach under the control panel and gently squeeze the two retaining clips together to detach the control panel from the upper case.

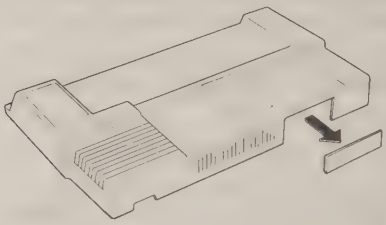
4. Slip the control panel back through the case opening.



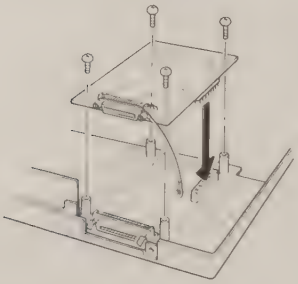


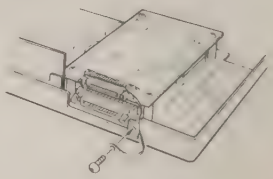


5. Lift off the upper case and detach the shield plate.



6. Attach the interface board, making sure that the connector pins match the mating connector on the main circuit board. Secure the board with the screws provided.
7. Remove the ground screw located at the back of the printer. Using this screw, connect the round end of the FG wire of the interface to the printer frame.





8. Reassemble the printer.

Note
When replacing the upper case, take care not to pinch the FG wire between the upper and lower sections of the case.

IX-800 in jet printer

Caution
Make sure that power to the printer and the computer is turned off. Then, disconnect both the AC power and interface cables from the printer.

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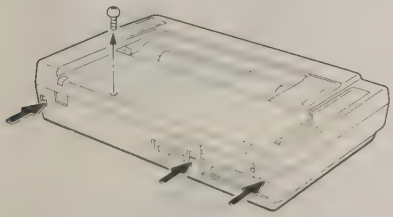
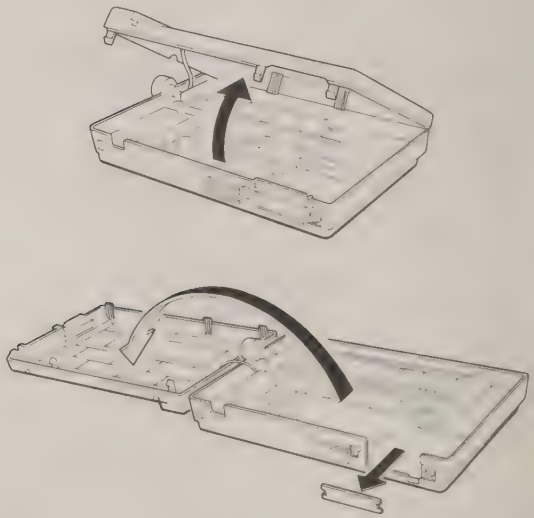
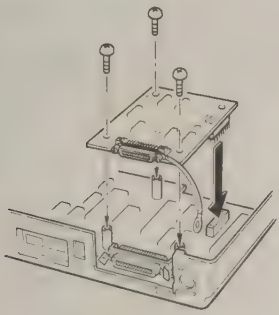
1. Remove the dust cover and ribbon cartridge.
2. Remove the screw retaining the upper case of the printer using a cross-head screwdriver.
3. With the printer's back facing you, unclip the three retaining clips by gently pushing them inward.

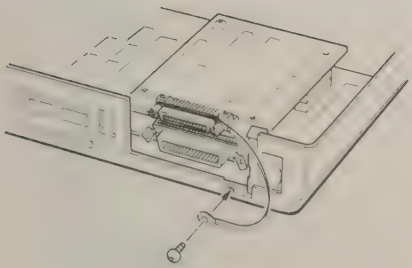


4. Partially raise the upper case from the back and release the hinges at the front edge. Be careful not to strain the control panel cable located on the side of the printer next to the paper feed knob.
5. Carefully turn the upper case upside down, following the direction of the arrows in the diagram below. Again, make sure not to strain the control panel cable.
6. Remove the shield plate.



7. Attach the connector pins on the interface to the matching connector on the main board, and then secure the board with the screws provided.
8. Remove the ground screw at the rear of the printer. Use this screw to attach the FG wire to the frame of the printer.

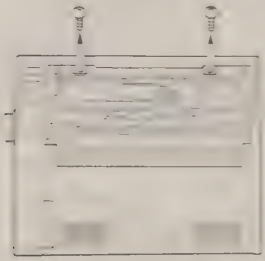




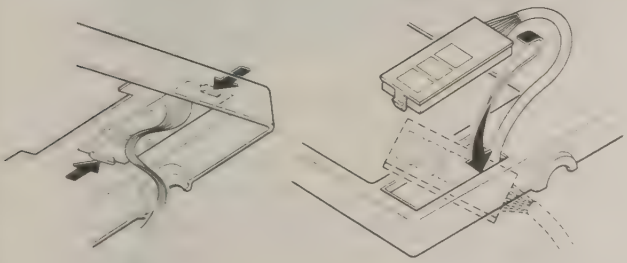
9. Reassemble the printer.

Caution
Make sure that power to the printer and the computer is turned off. Then, disconnect both the AC power and interface cables from the printer.

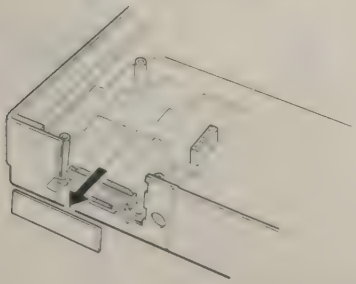
1. Remove the dust cover and ribbon cartridge.
2. Remove the two upper case retaining screws using a cross-head type screwdriver. (There are three screws on the LQ-1000)



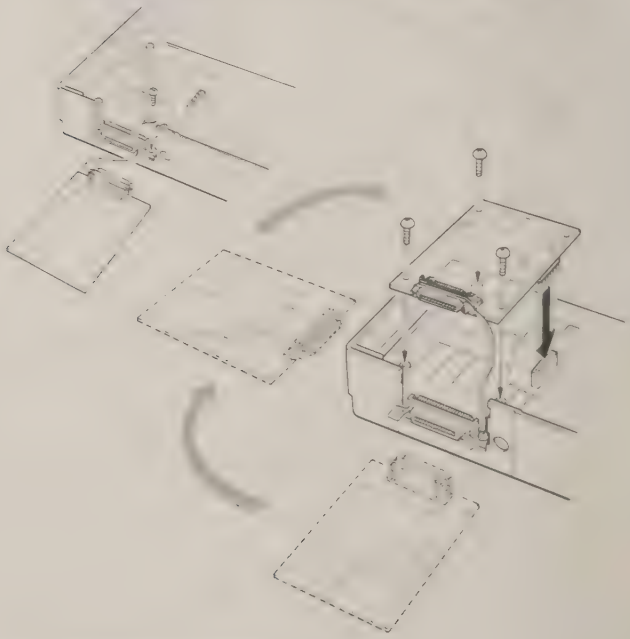
3. Partially raise the upper case being careful not to strain the cable connected to the control panel. Reach under the case and detach the control panel by squeezing together the two retaining clips.
4. Slip the control panel back through the upper case.



5. Remove the upper case.
6. Detach the shield plate from the back of the lower case.



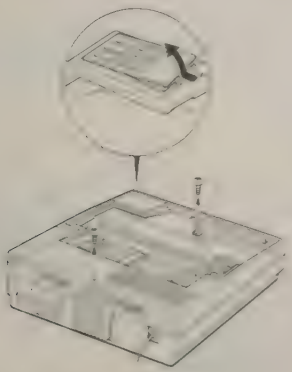
7. Remove the FG screw from the main board. Carefully place the interface board next to the printer as shown below, and connect the round end of the FG wire to the main board using the FG screw.
8. Holding the interface board level, rotate it clockwise into position and then carefully insert the connector pins into the mating connector on the main board.
9. Secure the board with the retaining screws provided.



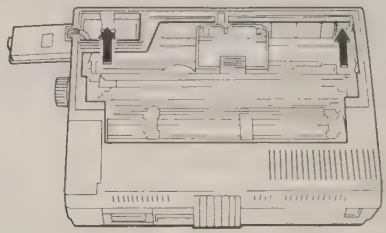
10. Reassemble the printer.

Caution
Turn off the power to the printer and the computer before installing the serial interface. Make sure that all power and interface cables are removed.

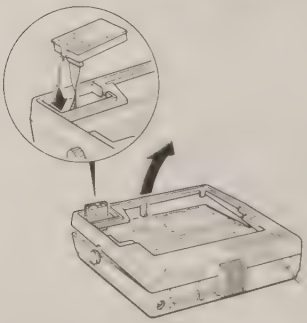
1. Remove the dust cover, paper guide, and any option that may be installed, such as a cut-sheet feeder or a tractor unit.
2. Remove the option compartment cover and any option cartridges.
3. Remove the ribbon cartridge and slide the print head to the middle of the printer.
4. Remove the upper case retaining screws.
5. Unclip the control panel and lift it up slightly to release it from the case.

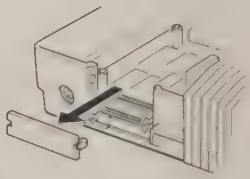


6. Position the control panel as shown below.
7. Gently press the two retaining clips to release the front of the edge of the upper case.



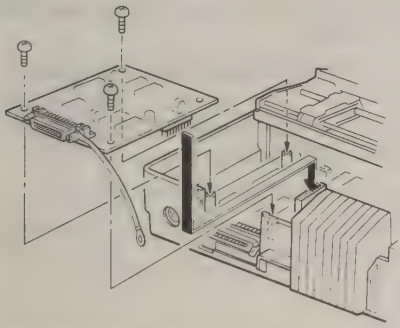
8. Tilt the upper case up and slip the control panel through the opening, being careful not to strain the connector cable.
9. Lift the upper case to release the hinges at the rear edge, then lift it away from the printer.
10. Remove the shield plate.



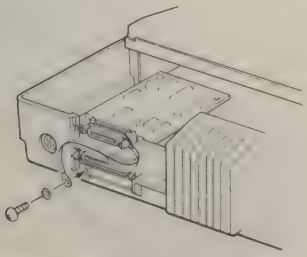


11. Insert the board beneath the printer mechanism following the direction indicated by the dotted lines. Be sure that the free end of the FG wire attached to the interface is outside of the printer case.

12. Carefully plug the board into the connector marked CN2 on the main circuit board and secure it with the screws provided.



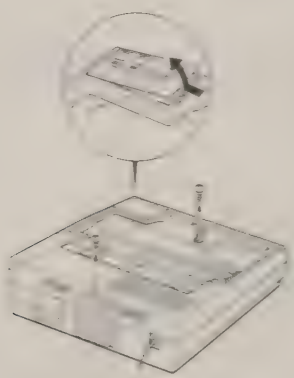
13. Remove the ground screw located at the rear of the printer, near the parallel port. Using this screw, connect the round end of the FG wire to the printer frame.



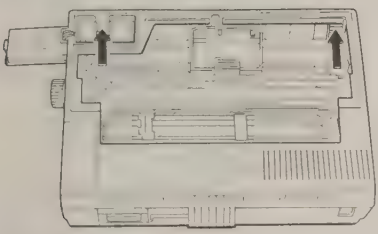
14. Reassemble the printer.

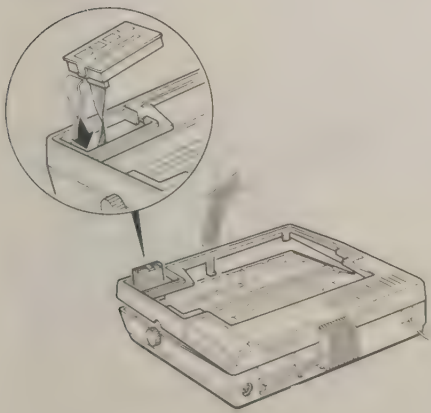
Caution
Turn off the power to the printer and the computer before installing the serial interface. Make sure that all power and interface cables are removed.

1. Remove the dust cover, paper guide, and any option that may be installed.
2. Remove the option compartment cover and any option cartridges.
3. Remove the ribbon cartridge and slide the print head to the middle of the printer.
4. Remove the upper case retaining screws.
5. Unclip the control panel and lift it up slightly to release it from the case.



6. At each side of the front panel there is a retaining clip, as shown below. Reach behind the cable and gently press these clips to release the front edge of the upper case.
7. Partially raise the upper case and slip the control panel through the opening.
8. Raise the upper case to release the rear hinges and lift it away from the printer.

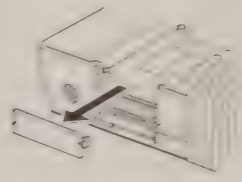


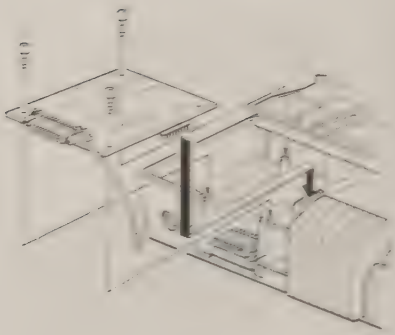


9. Remove the shield plate to allow access to the new interface connector.

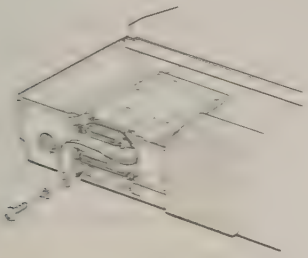
10. Insert the board beneath the printer mechanism following the direction indicated by the dotted lines. Be sure that the free end of the FG wire attached to the interface rests outside of the printer case.

11. Carefully plug the board into the connector marked CN2 on the main circuit board and secure it with the screws provided.





12. Remove the ground screw located at the rear of the printer. Using this screw, connect the round end of the FG wire to the printer frame.



13. Reassemble the printer.

SQ-2500 ink jet printer

1. Make sure that the print head is properly capped by setting the printer off line.

Caution
Make sure that power to the printer and the computer is turned off. Then, disconnect both the AC power and interface cables from the printer.

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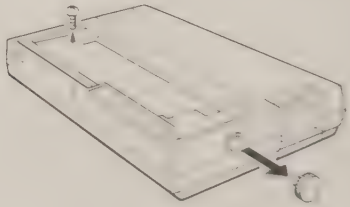
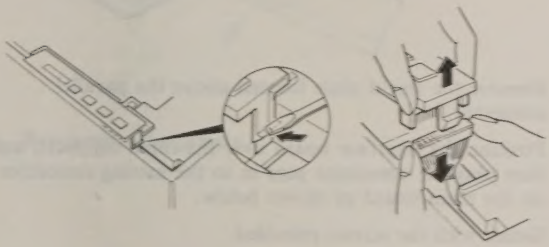
2. Detach the printer lid and sheet guide as well as ay options, such as a cut-sheet feeder or a tractor unit.
3. Remove the module cover and any modules installed.
4. Remove the ink cartridge compartment cover.
5. Remove the paper feed knob.
6. Remove the single screw retaining the upper case of the printer using a cross-head screwdriver.



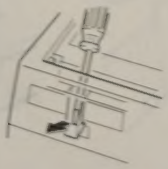
7. Unclip the control panel by lifting it gently from the right side with a screwdriver.

8. Detach the control panel from the connector cable. When disconnecting the panel, grasp the connector above the wires. This will prevent the wires from being damaged when you pull the control panel loose from the connector.

Caution
Avoid touching the printed circuit board on the underside of the control panel.



9. Insert a blade-type screwdriver through the slots at the front of the upper case and carefully release the four retaining clips.



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